DEEP-SEA OCEANOGRAPHIC EXPLORATION IN INDIAN WATERS

BY

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(With three plates)

The science of Oceanography is of relatively very recent origin, and is of such a wide nature that it necessitates the study of many other branches of science. It includes not only the chemistry and physics of the sea-water and a study of the meteorological conditions of the atmosphere but also a detailed study of both botany and zoology, since the oceans are inhabited by both plants and animals, and the distribution of the flora and fauna necessitates a study of the physiology and the manner in which animals and plants are adapted to the particular conditions in which they live and the degree to which such differences in the environment can influence the growth and development of the animal or plant. These conditions show a very wide range of variation both horizontally as one passes from the warm tropical area to the cold Arctic and Antarctic regions, and vertically as one passes from the surface of the sea down to the great depths. The study of the ocean floor and of the sedimentary deposits that cover so much of its surface calls for the application of seismology, geology and petrology, while the changes that are continually going on in these bottom deposits require a knowledge of organic chemistry and bacteriology.

Only a hundred years ago scientists were of the opinion that living organisms could not possibly exist in the very peculiar conditions that are present in the great depths of the ocean, such as the complete absence of sunlight, the cold temperature and the enormous pressure that may amount to several tons to the square inch in the deepest layer; it was thought that a depth of about 400 fathoms was the lowest level at which life could exist, but within a few years this view was to be proved wrong.

During the nineteenth century it had become recognised that very valuable contributions to our knowledge could be achieved by providing a scientist to accompany any expedition, and that the experience so gained would be of great value to whoever was selected. By the middle of the century several British scientists had achieved world-wide reputations as a result of their work on such expeditions. I need only mention the names of Charles Darwin, who sailed round the world in the 'Beagle' in 1831-36; Joseph Hooker, who accompanied Sir James Clark Ross to the Antarctic in the 'Erebus' and 'Terror' in 1839-43; and T. H. Huxley, who sailed as Assistant-Surgeon in the 'Rattlesnake' to Australia and the Great Barrier Reef in 1846-50. The development of inter-continental communication that took place as a result of the invention of the telegraph, and the necessity of a careful survey of the lines along which submarine cables could safely be

laid, resulted in several cable-ships being sent out to study the contours of the sea-bed and select suitable routes. One of the vessels engaged in this work was the 'Bulldog' under the command of Captain M'Clintock, which was engaged in surveying a line for the trans-Atlantic cable between England and North America in 1860. Accompanying this expedition was Surgeon-Major G. C. Wallich, who had retired from the Indian Medical Service and who was the son of Nathaniel Wallich who had been the Superintendent of the Sibpur Botanical Gardens. Wallich showed beyond any doubt that animals could live at depths below 1,000 fathoms; and in consequence of his discoveries British zoologists persuaded the Admiralty to send out an expedition to investigate the Atlantic deep water round the British Isles and in the Bay of Biscay, at first in the 'Lightning' in 1868 and in the 'Porcupine' in 1870. The success of this work led to the famous voyage of the 'Challenger', which carried out during the years 1872-76 investigations in all the great oceans on the fauna and flora, the character of the sea-water at all depths and a study of the bottom and its sedimentary carpet, thus laying the foundations for the science of Oceanography.

During the years 1832-62 a survey of Indian waters had been conducted by the Indian Navy: but this service was abolished in the latter year. From time to time ships of the Indian Navy had carried medical officers, who were interested in biology and took the opportunity to carry out valuable research work. Two of these officers became distinguished, namely Dr. H. J. Carter, F.R.S., and Dr. Theodore Cantor, the former becoming one of the leading authorities on the lower invertebrata, especially the Porifera, and the latter on the fishes of the Malay Peninsula.

With the abolition of the Indian Navy, the Marine Survey temporarily ceased; but in 1872 the Government of India inaugurated the Marine Survey of India and the very important work being done at this time by the 'Challenger' caused the Asiatic Society of Bengal to urge the Government of India to include in the ship's company the appointment of a Surgeon-Naturalist whose duty it would be to carry out, when opportunity offered, in Indian waters not included in the 'Challenger' programme, similar investigations into the fauna of the deep sea and also the conditions that existed at different depths and the character of the sea bottom. This proposal was warmly supported by Commander Dundas Taylor, who was appointed to command the Marine Survey. The Government of India agreed to this proposal and in 1875 the post of Surgeon-Naturalist was created and Surgeon J. Armstrong was appointed. He was the first of a succession of Indian Medical Service officers, who during the next 51 years either temporarily, or in three cases permanently, devoted their attention to the study of zoology and so, if I may adopt the charming phrase by which Phillip Gosse in his autobiography summed up his own life's work, became 'A Truant from Medicine'. Armstrong continued to hold the appointment till 1879, but as no suitable vessel was then available he could only carry out observations in shallow water and in the littoral region, at first in S. S. 'Clyde' and later with a boat-party. He relinquished the appointment in 1879 and the post remained vacant till 1884. The honour of being

the first to carry out deep-sea biological work in Indian waters fell, not to the Surgeon-Naturalist, but to an officer of the Indian Museum, Calcutta, Dr. J. Wood-Mason, who was sent in 1871 by the Trustees of the Museum to investigate the fauna of the Andaman Islands. During the four months that he spent in these islands he managed to persuade the Governor to allow the Guard-Ship, S.S. 'Undaunted' to work for him for one day and so was able to carry out trawls in depths of 100 to 300 fathoms.

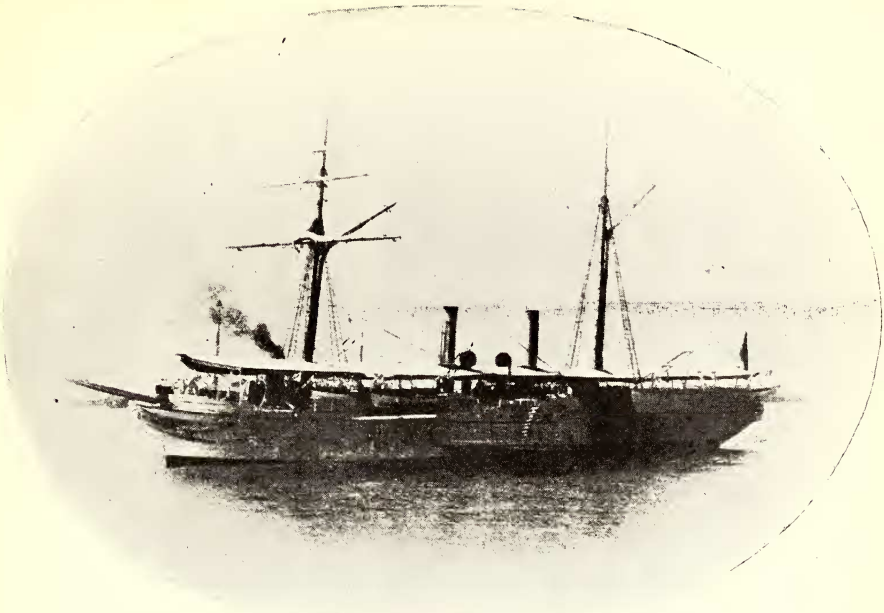
The first of the Indian Marine Survey ships was built in 1879-80. She was a wooden paddle-steamer of 580 tons and was launched in 1881, being given the name 'Investigator', thus continuing a tradition that existed in the British Empire, for in 1850 a vessel of this name was one of the ships sent out to try and discover what had happened to Sir John Franklin and his crew, who had sailed from England in 1846 to try and discover a north-west passage between the Atlantic and Pacific oceans. There had also been among the ships of the Bombay Marine a previous 'Investigator' which had carried out hydrographic investigations as a secondary part of her duties. In 1878 Lieut. Jarrard, R.N., who had been appointed to the Marine Survey of India under Commander Dundas Taylor, was in England on leave; the 'Challenger' had recently returned from her world-cruise and Jarrard took the opportunity of consulting the scientists who had sailed in her regarding the apparatus necessary for deep-sea investigations. He then went to the Admiralty and requested their assistance and the Government of India also asked for some of the 'Challenger' apparatus to be presented to the 'Investigator'. The Admiralty was willing to do so, and so it came about that when the Marine Survey of India commenced deep-sea work in Indian waters they were actually using 'Challenger' gear. The post of Surgeon-Naturalist remained vacant till 1884, but in that year Commander Alfred Carpenter, R.N., who had been one of the officers in the 'Challenger', was appointed to command the Marine Survey and Surgeon G. M. J. Giles was appointed Surgeon-Naturalist, and deep-sea research became one of the duties, if only a secondary one of the Survey.

It may be of some interest to my readers if I give here a brief account of the position that the Surgeon-Naturalist occupied on board the survey vessel at any rate as it was in my day. The Surgeon-Naturalist, when first appointed, was usually a relatively junior officer, either a Lieutenant or Junior Captain; he was the Senior Medical Officer of the ship and so was directly responsible to the Captain for the sanitary condition of the ship and for the health of the officers, and indirectly for the health of the crew, which numbered about 110. To the Surgeon-Naturalist was attached an Assistant-Surgeon, who was directly responsible for the crew, the Surgeon-Naturalist merely keeping a watchful eye on his work and only intervening when a lascar had been on the sick-list for more than three days. As the ship's crew were specially selected at the commencement of each survey-season and the vessel was at sea on the survey-ground for some twenty-seven or twenty-eight days in each month, only returning to port in order to re-victual and re-coal for about three days, there was very little sickness on board, and surgical work was almost non-existent unless there was an accident in the engine-room or

an emergency, such as a dislocated limb or a fracture. There was thus plenty of time for biological and other scientific investigations. As he was the only 'land-lubber' among a group of professional sailors, the attitude of his colleagues to him would to some extent depend on whether or not he proved to be a good sailor and could stand up to a certain amount of rough weather, and also was a 'good mixer' and could take a certain amount of good-natured 'leg-pulling' by his ship-mates: for instance, on Sunday mornings the Officer-Commanding occupied the Ward-Room for the purpose of carrying out a function known as 'Signing all Books', a business with which the Surgeon-Naturalist had no concern. One Sunday morning I was on deck chatting to some of my brother officers, when a lascar came up from below, saluted, and said to me, 'The Captain wishes to see you, Sir'; so I put on my jacket and cap and went down to the Ward-Room. I saluted and said, 'You wish to see me, Sir?'; 'Yes, I certainly do', said he with a grim expression on his face. 'How long have you been in this ship?' 'About ten years, Sir', said I, wondering what the trouble could be and whether my Assistant-Surgeon had failed to carry out his duties properly and I had failed to discover his error. 'Ten years! *Ten* years!! and you don't know better than this.' Clearly, whatever had gone wrong I was going to be held responsible. 'What's the trouble, Sir?' I asked. 'What's the trouble?', he replied, 'What's the trouble? Here we are, the 15th of the month and your wine-bill is only Rs. 5'. 'Well, Sir, that's easily remedied. What's yours?' 'Thanks very much, I'll have a cocktail'!

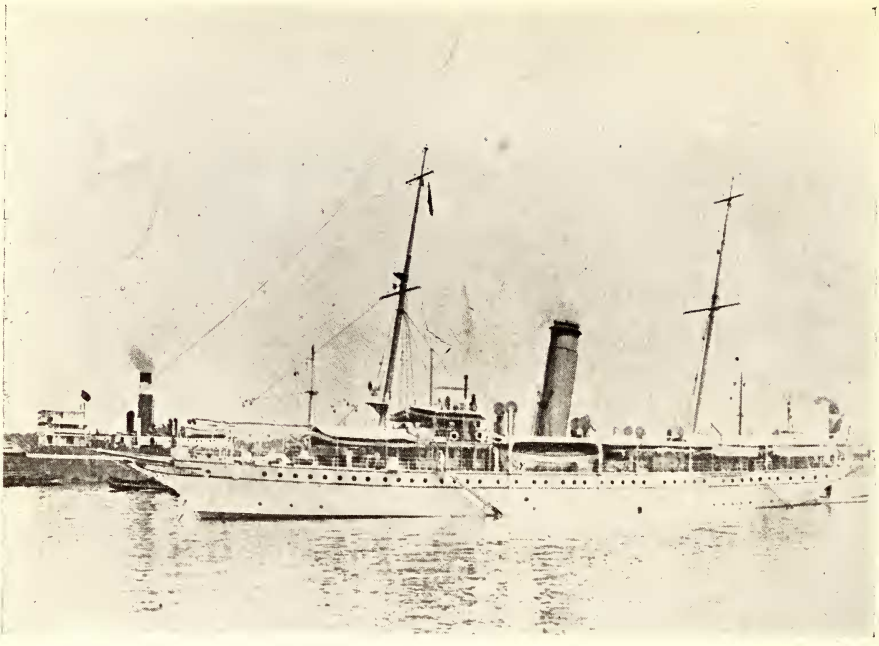
In the early years of the Survey the areas that most urgently needed investigation around the coasts of India and Burma were relatively small and scattered, and several of these might be visited and surveyed each year. It thus happened that the 'Investigator' might traverse the Bay of Bengal several times in a single season and it was during such runs that deep-sea trawls could be carried out. The publication of Charles Darwin's great work on 'The Origin of Species' in 1859 had thrown a new light on the study of zoology, and the work of the 'Challenger' had proved conclusively that animals were to be found living at almost all depths between the surface and the sea-floor; it had been hoped that the investigation of the fauna of the great oceans might reveal a number of 'missing links' in the evolution of the species of the present day. Though the hope was not realised, it was but natural that the Surgeon-Naturalist should take more interest in and concentrate his energies on a study of the deep-sea fauna rather than on the physico-chemical character of the sea-water or the nature of the sea-floor.

In the year 1888 A. Alcock was appointed to be Surgeon-Naturalist and he held the post till 1892. In the accompanying Table I give the number of trawls that were carried out by the 'Investigator' in each 5-year period from the commencement of the work in 1885 till it came to an end in 1926. A reference to this shows that a great increase in the number took place during his tenure of the office, and some idea of the mass of material that was collected during these early years can be got from 'A Summary of the Deep-Sea Work of the Royal Indian Marine Survey Ship "Investigator" from 1884 to



R.I.M.S. ' INVESTIGATOR I '

The name ' Investigator ' carved on the facade of the Oceanographic Institute at Monaco



R.I.M.S. 'INVESTIGATOR II'

H.E.M.S. 'MABAHISS'

Arriving back at Alexandria, May 25, 1934

1897' published by Alcock in the series of 'Scientific Memoirs by Medical Officers of the Army of India' in 1898.

TABLE SHOWING THE NUMBER OF TRAWLS OF DIFFERENT KINDS MADE DURING EACH 5-YEAR PERIOD BETWEEN 1885 AND 1925

Year	Agassiz trawls		Mid-water trawls
	Deep	Shallow	
1885–1889	21	43	...
1890–1894	52	55	...
1895–1899	55	21	..
1900–1904	76	13	...
1905–1909	30	4	...
1910–1914	10	25	4
1921–1925	3	1	3

I give below a list of the numbers of the various species and genera that were obtained during this period from depths below 100 fathoms.

	New species and varieties	Previously known species	Number of genera
Protozoa	8	...	...
Porifera	26	5	11
Madreporaria	17	8	14
Cnidaria	...	...	...
Asteroidea	39	15	26
Ophiuroidea	38	17	23
Echinoidea	6	2	6
Holothuroidea ...	6	11	12
Crustacea:			
Cirripedia	2	...	2
Amphipoda ...	3	...	3
Isopoda	...	2	2
Stomatopoda ...	2	...	1
Schizopoda	2	8	5
Macrura	54	43	45
Anomura	35	5	6
Brachyura:			
Cancroidea ..	5	...	5
Ocypodoidea ...	2	...	2
Oxystoma ...	13	...	9
Oxyrrhyncha ...	10	4	8
Pycnogonida	...	2	1
Mollusca:			
Lamellibranchiata ...	31	8	23
Gastropoda	31	7	24
Scaphopoda ...	5	1	1
Cephalopoda ...	6	4	8
Pisces:			
Chondropterygii ...	5	1	5
Acanthopterygii ...	23	15	30
Anacanthini ...	48	8	24
Physostomi... ...	41	16	39
Plectognathi ...	1	...	1
Grand Total ...	459	182	336

In spite of the enormous advances that had already been made by the 'Challenger', no less than 71 out of every hundred species or varieties recorded from Indian waters proved to be new. These zoological results were embodied in a magnificent series of 'Investigator' Memoirs, that were published by the Trustees of the Indian Museum, namely:—

Echinoderma, pts. 1-8	1889-1914
Squillidae	1895
Brachyura	1899
Fishes	1899
Decapoda, Macrura and Anomala ...	1901
Crustacea, pts. 1-3	1901-1906
Hexactinellid Sponges	1902

Accompanying these Memoirs a series of plates was published by the Royal Indian Marine under the title of 'Illustrations of the Zoology of the Royal Indian Marine Surveying Steamer "Investigator" between 1892 and 1909'. In addition to the faunistic work of the Surgeon-Naturalist, other observations were made on the temperature of the sea-water at both the surface and near the bottom and a number of samples of the bottom deposits were taken and reports dealing with 'The Mean Temperature of the Deep Waters of the Bay of Bengal' and the 'Topography of the Arabian Sea in the Neighbourhood of the Laccadive Islands' were published in the *Journal of the Asiatic Society of Bengal* by two of the officers commanding the Marine Survey, namely Captain A. Carpenter in Vol. LVI in 1887, and Captain Oldham in Vol. LXIV in 1895. But the observations on the bottom deposits were not published till many years later, when I was able to collate them and get them published.

By the beginning of this century the zoological work of the Marine Survey of India had attracted world-wide attention, and the great importance of these contributions to our knowledge of marine life had earned for the 'Investigator' the honour of having her name carved on the facade of the new Institute of Oceanography in Monaco that was erected by H. R. H. Prince Albert I. I am greatly indebted to Captain Rouch for having this photograph specially taken for me. Other well-known ships similarly honoured were the 'Challenger', 'Travailleur', 'Talisman', 'Gazelle', 'Novara', etc. These investigations had also built up for succeeding Surgeon-Naturalists such a high reputation that in 1913, although I was but a junior officer of the Indian Medical Service and had held the appointment for only two-and-a-half years, I was appointed a Vice-President of Section V, Oceanography, at the meeting of the International Congress of Zoology that was held at Monaco that year.

From 1904 on, the number of trawls that were carried out shows a somewhat rapid decline. The amount of deep-sea work that the Surgeon-Naturalist could get done depended on the situation of the survey ground, and as the whole of the survey season was now spent, as a rule, in one particular region the only time that the ship was in deep water was during her passage to and from her home port of Bombay at the commencement and conclusion of the season's work:

thus the time that could be devoted to trawling became less and less. Another very important factor was the interest, or lack of it, shown by the Officer Commanding. By this time the novelty had worn off and so one had to use to the utmost one's powers of persuasion, and if this failed other steps had to be taken. There is a story of one of my predecessors that illustrates this: the Surgeon-Naturalist naturally wanted to get as many trawls carried out as he could, but the O.C. wasn't interested: however, he hated to see any of his officers with no work to do, so the Surgeon-Naturalist devised a scheme which consisted of getting a comfortable deck-chair, which he placed on deck where he could be seen from the bridge, and settled himself there with a bottle of beer and the latest novel from the ship's library. Every time that the O.C. looked forward over the bridge-rail he couldn't help seeing this officer, and eventually this got too much for his feelings and he called down 'Got no work to do?' 'No, Sir; I am afraid not,' replied the Surgeon-Naturalist. 'Ha! Can't have this, we'll have a trawl'!!

In 1908 the old 'Investigator I' was scrapped and 'Investigator II' took her place. The new vessel was a steel ship built by Vickers Maxim and Co., of a gross tonnage of 1,018 tons and capable of steaming at about 14 knots. Owing to the decline in the amount of deep-sea work the Surgeon-Naturalist was able to commence work in other branches of oceanographic research and so when I was appointed in 1910 I took up the study of the Copepoda which form an important constituent of the floating population of the sea, termed the Plankton, and of the conditions of salinity and temperature of the sea-water in which these animals live. I also collated all the previous observations that had been made on the topography and nature of the sea-floor. The results thus obtained have been published in the *Memoirs of the Asiatic Society of Bengal,* Vol. IX, between the years 1925-35.

While on the survey-ground the 'Investigator' anchored each night in the week, and from mid-day Saturday to Monday morning in some more or less sheltered locality. In order to obtain samples of the surface plankton one or more tow-nets were put out at 6.00 p.m. and the tide was allowed to drift through them till 6.00 a.m., when they were hauled in and the catch was taken down to the laboratory for examination and preservation. Samples of the surface-water and a record of its temperature were taken, usually at four-hourly intervals throughout the day at 4, 8 and 12 a.m. and p.m.: certain meteorological observations, such as the air-temperature readings by both wet- and dry-bulb thermometers, the barometric pressure and the strength and direction of the wind were also made. The water samples were examined as soon as possible after they had been collected. All this, involving both day and night work was, as must be obvious, considerably more than one individual could accomplish; but I was greatly assisted by the ship's staff, both officers and men, and to them I owe a deep debt of gratitude. There were occasions when some fluid other than sea-water was substituted for the sample that had been taken during the night, but examination at once revealed the substitution, and on a protest being made the true sample was usually

forthcoming. When all these observations were correlated and compared with the total quantity of the plankton or with the number of any particular organism, such as the common Salp, *Salpa* (*Thalia*) *democratica* (Forskal), some very interesting results were obtained. It was found that the salinity of the surface water exhibited a double diurnal variation that at one period of the year coincided and at another alternated with the rise and fall of barometric pressure. The conclusion to be drawn seems to be that with the change of barometric pressure there is a corresponding change in the strength of the wind, and that an increase in the wind-force brings about a corresponding increase in the lateral movement of the surface water that is compensated for by an upwelling of water from some depth below the surface, this deeper water having a lower salinity than the surface water during the hot dry period of the year in consequence of evaporation and a higher salinity during the wet, cold period owing to the dilution of the surface water by rainfall and the increased influx of river water into the neighbouring area. The salinity of the surface water also showed oscillations of a longer period, from a few days to as long as a fortnight, in different localities, and these oscillations appear to correspond, as regards their period, to the estimated time of a 'seiche', i.e., to a to-and-fro swing of the deep water in the basin in which the locality is situated, as for instance in the Andaman Sea. During the monsoon periods the wind, blowing in a particular direction, causes a piling up of the surface water on one side of the basin and a corresponding depression of the level of the deep water, and when the wind ceases the two strata of water, upper and lower, begin to re-adjust themselves so that the boundary in between shall once again be horizontal. In this process the level of the deep water swings up and down on the two sides of the basin, rising at periodic intervals nearer to the surface where admixture with the surface layer can be brought about by wave action: accompanying this periodic rise and fall in the salinity there may occur a marked rise and fall in the number of some of the planktonic organisms in the surface water. After a year's experience of purely surface work I was desirous of extending these observations to the mid-water regions. I therefore requested the authorities of the Royal Indian Marine to sanction the construction in the dockyard of nets suitable for mid-water trawling. At first my request met with some degree of opposition and I was asked what put this new idea into my head, and why I should suppose that the Marine Survey should undertake it; but when I pointed out that it was no new idea, since observations of this type had been carried out by the 'Challenger', and that it did not exactly reflect credit on the Marine Survey that they had for so many years entirely neglected this important branch of oceanographic research, consent was given and a 6-foot square mid-water trawl was constructed. Four hauls of this net, taken in the survey-season 1911-12 at depths of from 375 to 475 fathoms yielded some very interesting catches and very greatly increased the number of Copepoda that were known to inhabit Indian waters.

The outbreak of the First World War in 1914, brought the work of the Marine Survey to an end for the time being, and it was not

till 1921 that I was able to resume my marine investigations. During the next four years the 'Investigator' was engaged in surveying in the Maldive Archipelago and in the central group of the Nicobar Islands, regions in which there is a profuse growth of coral, and I was thus able to study the probable mode of formation and the present conditions existing in such localities; but there was little opportunity for continuing deep-sea work.

On my relinquishing the appointment of Surgeon-Naturalist in 1925 Major R. W. G. Hingston was appointed; but he only held the post for one year after which he resigned from the Indian Medical Service, and the post again became vacant. The Director-General of the Indian Medical Service notified the Government of India that there was no officer serving under him who appeared to have the necessary qualifications, and he recommended that the post should be abolished. In my capacity of Director of the Zoological Survey of India I strongly opposed this and urged the Government of India not to abolish the post altogether but to change its character and substitute for the Surgeon-Naturalist the post of Naturalist to the Marine Survey and attach it to the Zoological Survey of India. This the Government of India agreed to do, but although this post continues to exist in theory, in practice no appointment has ever been made. Thus in 1926 the work of the Surgeon-Naturalist came to an end.

The scope and the methods employed in the study of oceanography have rapidly expanded during the last half century. New discoveries in other sciences (and especially in physics) have been adapted for oceanographic work and have resulted in a very considerable advance in our knowledge of the oceans: one of the first of such inventions was the development of 'Asdic' during the 1914-18 war. This method made use of an echo for the detection of enemy submarines; but later it was adapted to give the depth of water below a vessel, and a ship fitted with the apparatus was able to take soundings at the rate of about 25 to the minute, while steaming on her course whereas previously, by the lead and sounding-wire method, a single deep sounding used to take two hours or more, during which time the ship was stopped and was manoeuvred to keep the wire straight 'up and down'. While greatly increasing our detailed knowledge of the features of the ocean bottom, this method has one great disadvantage, it does not give one a sample of the bottom deposit. More recently another method for the study of the ocean bed has been borrowed from the science of seismology and by exploding a small charge either on the sea-bed or in the water above it and by getting accurate records of the time taken for the resulting vibrations to pass down into the sea-bed and be reflected back to the recorder on the vessel, an estimate can be made of the depth at which different strata lie below the carpet of bottom sediment and of the thickness of these strata.

From time to time research vessels have passed across the southern region of our Indian waters either on their way to or return from other parts of the world. In 1899 the German Deep-Sea Expedition in the 'Valdivia' on her return voyage crossed from the northern point of Sumatra to Colombo and on to Dar-es-Salam in Africa and then turned up the African coast to the Gulf of Aden and the Red

Sea; in 1928-30 the Danish Carlsberg Expedition in the 'Dana' during her world-cruise followed much the same course but on reaching the African coast turned southwards to pass round the Cape of Good Hope. The 'Dana' was equipped with echo-sounding apparatus, and during her passage across the southern part of the Arabian Sea obtained evidence of a great submarine mountain range rising from the bottom of the ocean. The late Prof. Johannes Schmidt, the Leader of the Expedition, from a study of these and previous soundings, concluded that a great submarine range extends roughly from the island of Socotra off Cape Guarda-fui to the Chagos Archipelago, and for this ridge he suggested the name Carlsberg Ridge. In a paper that I submitted to the Asiatic Society of Bengal for publication in April, 1933, I had put forward the view that such soundings as were then available seemed to indicate that a submarine ridge ran in a south-westerly direction from the Indian coast in the neighbourhood of Karachi towards Socotra and I suggested that this might be a submerged continuation of the Kirthar Range of Sind that had been involved in the formation of the great 'fault' that had, at about the close of the Tertiary epoch, given India its present western coast-line.

The next stage in the exploration of the northern region of the Indian Ocean came in 1933 when the 'John Murray' Expedition to the Indian Ocean was fitted out and sailed from Alexandria in the Egyptian research vessel, H.E.M.S. 'Mabahiss'. The primary object of this expedition was to investigate the fauna of the deep water below 100 fathoms and the nature of its habitat, and the region to be studied was the area to the west of the Laccadive and Maldive Archipelagoes, so as to continue the previous investigations of the 'Investigator' westward to the African coast. For the most part these earlier investigations had been confined to the Laccadive Sea, the Bay of Bengal and the Andaman Sea, though in 1895-96 she had carried out a survey of the Indian coast off Karachi and in the region of the submarine gulley of the 'Indus Swatch'. She had also worked in 1901-02 in the Gulf of Oman and the Persian Gulf, and in 1904-05 along the Arabian coast and in the Gulf of Aden. Evidence of the richness of the fauna in this area was obtained at 'Investigator' Station 364 off the south coast of Arabia, in a depth of 110 fathoms, where over 500 examples of a species of 'Mantis Shrimp' were taken in the trawl. The story is told that the Surgeon-Naturalist, in view of the large number taken, concluded that the species must be a common one, though he couldn't remember having seen it before. He therefore preserved about 20 specimens and handed the remaining 480 over to the Mess cook, who made an excellent 'Prawn Curry' out of them, a change from ship-borne mutton that was greatly appreciated. On his return to the Indian Museum at the end of the survey-season, the Surgeon-Naturalist made a careful examination of his 20 specimens and then discovered that these represented a new species, which he christened *Squilla investigatoris*. It was thought that most of the big zoological museums all the world over would have been willing to give £1 for a co-type of this new species, so that this 'prawn curry' was one of the most expensive dishes ever served on board! No further examples of this species were taken till the 'Mabahiss' carried out a series of observations in the same

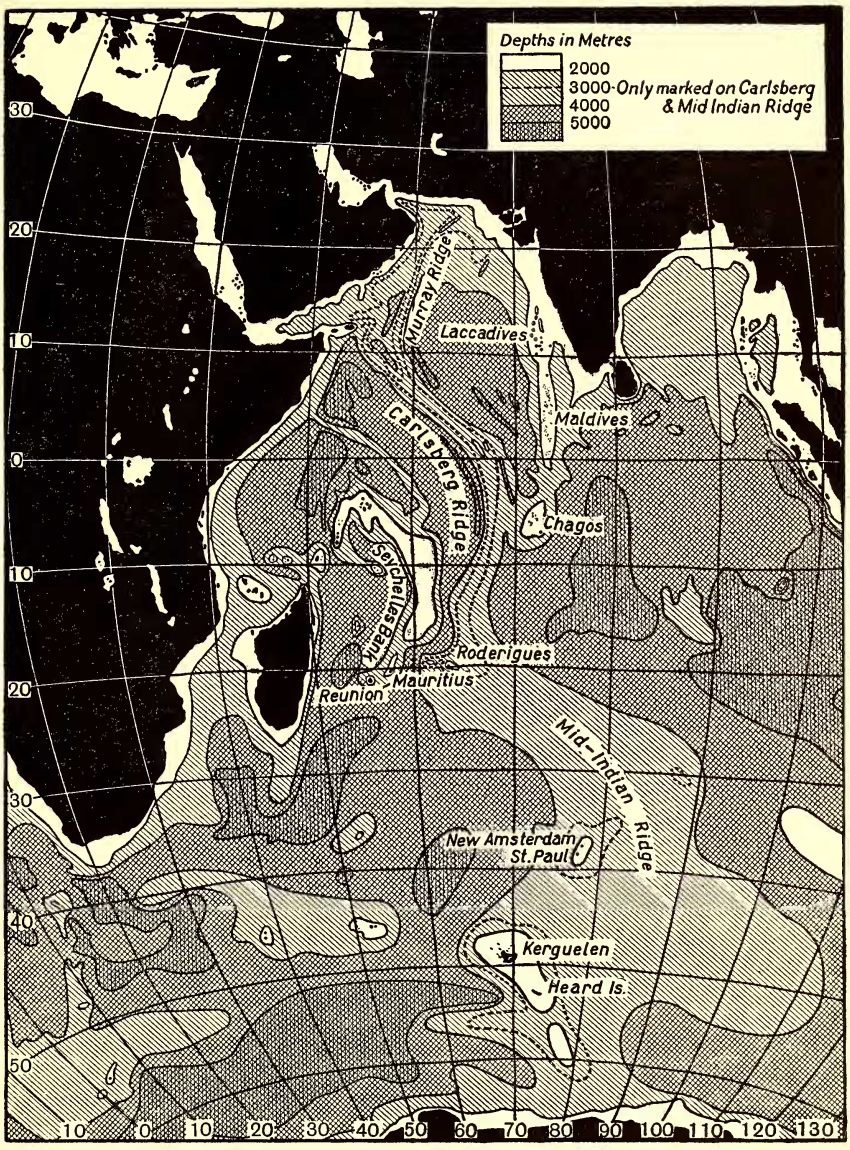


CHART OF THE ARABIAN SEA

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